

The compounds detected in residences during the indoor air quality studies do not generally match the compounds that were identified during the GC/MS analyses of the screen material. This implies that the screens were probably not the source of the compounds measured, which are typically associated with a variety of products often found and used in homes.

Based upon the data generated in the above studies, an association between identified screen emission products and the types of health effects that have been reported is not evident. Compounds identified during the screen analysis studies, with the exception of benzene, can generally be described as potential irritants at high enough concentrations. As demonstrated by the results of the residential air samples, identified screen emission products were not present in the air at the analytical limits of detection, which are more than 10,000 times lower than levels considered to be safe in industry, where such compounds are routinely encountered.

Degraded or weathered screen material has been observed to have a irritating or penetrating odor. This odor was very noticeable in a sample from which identifiable concentrations could not be captured by airborne sampling. This indicates that the compound(s) responsible for the odor has an extremely low odor threshold.

Midwestern Operations

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Clayton
ENVIRONMENTAL
CONSULTANTS

Dynamic Environmental Chamber Laboratory Study
for
Phifer Wire Products, Inc.
Tuscaloosa, Alabama

Clayton Project No. 46431.00

May 25, 1993

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1.0 INTRODUCTION

Mr. Charles E. Morgan, Executive Vice President and Corporate Counsel at Phifer Wire Products, Inc., authorized Clayton Environmental Consultants, Inc. to perform a laboratory study to characterize the potential offgassing of air contaminants from window screen products manufactured by Phifer Wire Products, Inc. According to information provided to Clayton by Phifer Wire Products, Inc., three households in southeastern Michigan have submitted a variety of complaints regarding symptoms the homeowners believe are associated with the presence of the window screening in their homes (e.g., foul odors, coughing, allergies, burning eyes, and upper respiratory infections). This report provides the results of Clayton's laboratory study.

Mr. Ronald C. Poore, Industrial Hygienist at Clayton, performed a field evaluation for indoor air quality in each of the three homes on January 18, 1993; at that time, he collected bulk samples of screen material from each home. The findings of Clayton's indoor air quality evaluation for these three homes are provided in the report addressed to Mr. Morgan and dated April 7, 1993 (Clayton Project No. 45870.00). The addresses of the three homes evaluated are listed below:

6710 Sun Valley Drive	5237 Sun Valley Court	6859 Tanglewood Street
Clarkston, Michigan	Clarkston, Michigan	Waterford, Michigan

The purpose of Clayton's current laboratory study was to establish emission rates of volatile organic compounds (VOCs) from weathered and non-weathered samples of the screen material. The dynamic chamber analysis chosen provides a realistic simulation of emission rates of VOCs from materials in place in the home. The scope of Clayton's services provided for this study was outlined in Clayton's proposal, dated January 27, 1993, and addressed to Mr. Morgan. An explanation of the terms and conditions under which this work was performed was incorporated into the proposal.

Tabulated analytical results of the laboratory investigation are provided in the Appendix.

2.0 METHODS AND MATERIALS

Clayton contracted a qualified laboratory to perform a dynamic laboratory analysis of gases emitted from weathered and non-weathered screen samples obtained during these assessments.

Bulk samples of weathered screen material were obtained from each of the three homes. One of these samples was randomly selected for the laboratory study. This sample of weathered screen material had been in place in one home since approximately November 1988. According to the homeowner, the family's symptoms (coughing, increased respiratory infections, burning eyes, burning nose, and throat irritation) began in May 1989. The screens were replaced in 1992, but their symptoms remained. The weathered screen material had been placed in plastic bags in dark storage since it had been removed. The screen material had been installed on the interior of the windows and was exposed to full sun. Weathering from the wind occurred only when the windows were opened to allow airflow from outside.

One sample of the non-weathered screen material was sent to Clayton by Phifer Wire Products, Inc., in November of 1992. This sample was manufactured in September of 1992. This sample was not exposed to wind or sun. At Clayton, the sample was stored in a sealed polyethylene bag and was not exposed to direct sunlight.

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Screen samples were placed in a polished stainless steel chamber at 50% relative humidity, 23° C (73.4° F) and 1 air-change per hour (the air was purified using a filtering system). The samples were allowed to equilibrate for 4 hours under these conditions. The VOCs liberated are then carried to a gas chromatograph/mass spectrophotometer (GC/MS) for analytical identification. Specific VOCs were identified using a library search routine, based on the GC retention time and mass spectral characteristics.

3.0 DISCUSSION

Analytical results indicate that the weathered screen material, obtained from one home and the non-weathered screen material, obtained from PhiFer Wire Products, Inc., offgas detectable amounts of alcohols, aldehydes, aliphatic hydrocarbons, aromatic hydrocarbons, and esters at 23°C and 50% relative humidity.

Results of analysis of the weathered screen material using the environmental chamber GC/MS technique are provided below.

Analyte	Total Emissions ($\mu\text{g}/\text{m}^2 \cdot \text{hr}$)*
Alcohols	25.9
Aldehydes (benzaldehyde)	1.4
Aliphatic hydrocarbons	40.6
Aromatic hydrocarbons	17.9
Unidentified compounds	3.7
Total VOC emissions	89.23

* $\mu\text{g}/\text{m}^2 \cdot \text{hr}$ means micrograms per square meter per hour

Results of analysis of the new screen material using the environmental chamber GC/MS technique are provided below.

Analyte	Total Emissions ($\mu\text{g}/\text{m}^2/\text{hr}$)*
Alcohols (2-butoxy ethanol)	1.7
Aldehydes (benzaldehyde)	2.5
Aliphatic hydrocarbons	112.6
Aromatic hydrocarbons (xylenes)	3.1
Esters (acetic acid, phenylmethyl ester)	3.1
Unidentified compounds	23.5
Total VOC emissions	162.2

* $\mu\text{g}/\text{m}^2 \cdot \text{hr}$ means micrograms per square meter per hour

Results of analysis of the weathered and non-weathered samples indicate that, although the weathered screen material offgases these weathered compounds at detectable levels, the concentration of total VOCs is approximately half the concentration emitted by the new non-weathered screen material. These results are consistent with research findings that indicate that emission rates decrease over time for many materials.

In comparing levels for specific classes of compounds, the non-weathered screen material primarily offgases aliphatic hydrocarbons ($112.6 \mu\text{g}/\text{m}^2 \cdot \text{hr}$), followed by unidentified compounds ($23.5 \mu\text{g}/\text{m}^2 \cdot \text{hr}$), aromatic hydrocarbons [xylenes, ortho- and para-isomers] ($3.8 \mu\text{g}/\text{m}^2 \cdot \text{hr}$), esters [acetic acid, phenyl methyl ester] ($3.1 \mu\text{g}/\text{m}^2 \cdot \text{hr}$), aldehydes [benzaldehyde] ($2.5 \mu\text{g}/\text{m}^2 \cdot \text{hr}$), and alcohols [2-butoxyethanol] ($1.7 \mu\text{g}/\text{m}^2 \cdot \text{hr}$).

The largest class of compounds detected in emissions from the weathered screen material is also aliphatic hydrocarbons ($40.6 \mu\text{g}/\text{m}^2 \cdot \text{hr}$), followed by alcohols ($25.9 \mu\text{g}/\text{m}^2 \cdot \text{hr}$), aromatic hydrocarbons ($17.9 \mu\text{g}/\text{m}^2 \cdot \text{hr}$), unidentified compounds ($3.7 \mu\text{g}/\text{m}^2 \cdot \text{hr}$), and aldehydes [benzaldehyde] ($1.4 \mu\text{g}/\text{m}^2 \cdot \text{hr}$). Esters were not detected in emissions from the weathered screen material.

The data indicate that the screens can be a source of VOCs. The emission of VOCs appears to decrease over time with the total emission rate of VOCs from the weathered screen being approximately half that of the new screen material. The data do not indicate that the screen material is the only source or the major contributor of VOCs in the homes. Other materials, such as cleaning agents, dry cleaning agents, and carpet adhesives in homes are also likely sources of VOCs.

This report submitted by:

Debbi L. Eckel for
Ronald C. Poore, IHIT
Industrial Hygienist

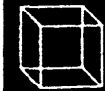
This report reviewed by:

Stephen D. Paul
Stephen D. Paul, CIH
Manager, Industrial Hygiene Services
Midwestern Operations

May 25, 1993

APPENDIX
RESULTS
OF
DYNAMIC CHAMBER ANALYSIS

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AIR QUALITY SCIENCES, INC.

ENVIRONMENTAL CHAMBER TEST REPORT

ELAPSED EXPOSURE HOUR	TVOC EMISSION FACTOR $\mu\text{g}/\text{m}^2\cdot\text{hr}$
4.000	162.20

Customer: Clayton Environmental

Sample Identification: AQS01453-001AA

Product Description: Screen; PH-11; New

Environmental Chamber: SA3

Product Loading: 1.00 m^2/m^3

Test Conditions: 1.0 ACH
50.0% RH \pm 2.0% RH
23.0°C \pm 1.0°C

Test Period: 04/13/93 - 04/13/93

Standard Test Methodology for Determining Volatile Organic Compound Emission Factors from Consumer Materials under Defined Test Conditions Using Small Environmental Chambers.

MSB
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**IDENTIFIED INDIVIDUAL VOLATILE ORGANIC COMPOUNDS
AT 4 ELAPSED EXPOSURE HOURS
 $\mu\text{g}/\text{m}^2\cdot\text{hr}$**

PRODUCT 01453-001AA, SCREEN, PH-11, NEW

CATEGORY	COMPOUND IDENTIFIED	EMISSION FACTOR $\mu\text{g}/\text{m}^2\cdot\text{hr}$
Acids	None detected	
Alcohols and Associated Compounds	Ethanol, 2-butoxy	1.7
Aldehydes	Benzaldehyde	2.5
Aliphatics	2-Undecene, 5-methyl-*	24.4
	Undecane, 4-methyl*	11.1
	Decane, 3-methyl	10.8
	1,6-Octadiene, 2,5-dimethyl-, (E)-*	8.8
	Decane, 2,5,9-trimethyl- (9CI)*	8.0
	Tridecane, 4-methyl-*	7.2
	Decane, 2,6-dimethyl	5.2
	4-Undecene, 8-methyl-, (Z)-*	5.2
	Dodecane	4.8
	Heptane, 2,2,4,6,6-pentamethyl- (8CI9CI)*	4.4
	Decane, 4-methyl	4.2
	2,2,7,7-Tetramethyloctane*	3.8
	Nonane, 3-methyl-5-propyl-*	3.3
	Decane, 2,3,7-trimethyl- (9CI)*	2.3
	Decane, 3,3,5-trimethyl- (9CI)*	2.3
	Decane, 2,2,3-trimethyl	2.2
	Dodecane, 2,5-dimethyl-*	3.2
	Tridecane	1.4
	Octane, 5-ethyl-2-methyl- (9CI)*	Tr

Released by Air Quality Sciences, Inc.
Date Prepared: April 20, 1993
AQS Project #: 01453
AQS Report #: 01453-01

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CATEGORY	COMPOUND IDENTIFIED	EMISSION FACTOR $\mu\text{g}/\text{m}^2\cdot\text{hr}$
Aromatics	Xylene, para	2.2
	Xylene, ortho	1.6
Esters	Acetic acid, phenylmethyl ester*	3.1
Halocarbons	None detected	
Ketones	None detected	
Turpenes	None detected	
Unidentified		23.5

*Indicates NBS best library match only.

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ENVIRONMENTAL CHAMBER TEST REPORT

ELAPSED EXPOSURE HOUR	TVOC EMISSION FACTOR $\mu\text{g}/\text{m}^2\cdot\text{hr}$
4.000	89.23

Customer: Clayton Environmental

Sample Identification: AQS01453-002AA

Product Description: Screen; PH-10; Weathered

Environmental Chamber: SA4

Product Loading: 0.96 m^2/m^3

Test Conditions: 1.0 ACH
50.0% RH \pm 2.0% RH
23.0°C \pm 1.0°C

Test Period: 04/13/93 - 04/13/93

Standard Test Methodology for Determining Volatile Organic Compound Emission Factors from Consumer Materials under Defined Test Conditions Using Small Environmental Chambers.

Released by Air Quality Sciences, Inc.
Date Prepared: April 20, 1993
AQS Project #: 01453
AQS Report #: 01453-01

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**IDENTIFIED INDIVIDUAL VOLATILE ORGANIC COMPOUNDS
AT 4 ELAPSED EXPOSURE HOURS**
 $\mu\text{g}/\text{m}^2\cdot\text{hr}$

PRODUCT 01453-002AA, SCREEN, PH-10, WEATHERED

CATEGORY	COMPOUND IDENTIFIED	EMISSION FACTOR $\mu\text{g}/\text{m}^2\cdot\text{hr}$
Acids	None detected	
Alcohols and Associated Compounds	1-Octanol, 2-butyl- (8CI9CI)*	6.8
	Cyclohexanol, 2-(1,1-dimethylethyl)*	5.8
	1-Hexanol, 2-ethyl	4.1
	Ethanol, 2-butoxy	3.7
	Ethanol, 2-ethoxy	2.9
	1-Dodecanol, 2-methyl-, (S)- (9CI)*	2.6
Aldehydes	Benzaldehyde	1.4
Aliphatics	Undecane, 6,6-dimethyl-*	11.6
	Undecane	6.7
	Undecane, 4,8-dimethyl*	4.5
	Decane, 4-methyl*	3.5
	Decane, 3,3,8-trimethyl- (9CI)*	3.5
	Decane, 2,2,6-trimethyl- (9CI)*	3.4
	Undecane, 4,6-dimethyl- (8CI)*	3.3
	Dodecane	2.6
	Decane, 2-methyl	1.5
Aromatics	Xylene, para	9.9
	Xylene, ortho	4.6
	Benzene, ethyl	2.0
	Toluene	1.4
Esters	None detected	

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CATEGORY	COMPOUND IDENTIFIED	EMISSION FACTOR $\mu\text{g}/\text{m}^3\cdot\text{hr}$
Halocarbons	None detected	
Ketones	None detected	
Turpenes	None detected	
Unidentified		3.7

*Indicates NBS best library match only.

Released by Air Quality Sciences, Inc.
Date Prepared: April 20, 1993
AQS Project #: 01453
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SUN CONTROL PRODUCTS

EXTERIOR SHADING FOR WINDOWS AND DOORS

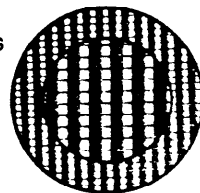


U.S. Patent No. 4,002,188

- Blocks the sun...Not the view
- Installs as a screen...Not a film
- Stops insects...Not the breeze
- Reduces glare...For added comfort

Phifer
SunScreen®

■ Phifer SunScreen solar screening blocks up to 70% of the sun's heat and glare before it penetrates windows and doors. Helps reduce cooling costs, sun fading and glare.



PACKAGING

Standard 100' Length Rolls: Individually wrapped.

Colors: Charcoal, Silver Gray, Bronze, Dark Bronze, Gold, White and Antique White.

DIY 25' Rolls: 4 rolls of one width per carton. Charcoal only.

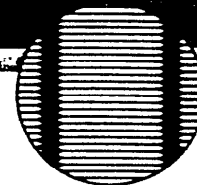
Standard Widths: 24," 30," 36," 42," 48," 60," 72" and 84," 42" available in Charcoal only. White and Antique White available in 36," 48," 60," 72" and 84" only. DIY 25' Rolls available in 24," 30," 36" and 48" only.

SunScreen DIY: Packaged 8 rolls per carton. Charcoal only.

Standard Sizes: 30" x 60" • 36" x 60" • 36" x 84" • 48" x 84."

Phifer
ShadeScreen®
LOUVERED ALUMINUM FOR SUN CONTROL

Blocks up to 87%
of the total annual
solar heat gain.

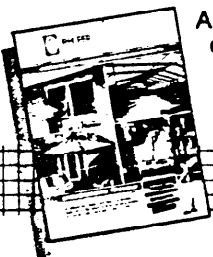


■ Manufactured originally by Kaiser Aluminum in 1949, ShadeScreen is now manufactured and distributed exclusively by Phifer.

The tiny open louvers of ShadeScreen block most of the sun's direct rays while affording excellent outward visibility. The new Black finish is architecturally neutral and offers improved shading and visibility when compared to previous finishes.

Standard Roll Length: 50 linear feet.

Standard Widths: 24," 30," 32," 36," 38," 42" and 48."



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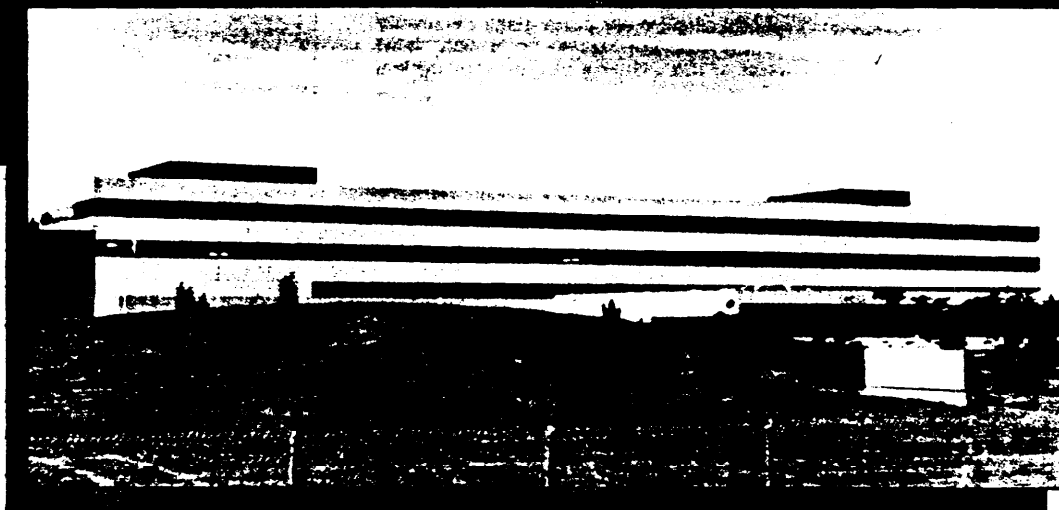
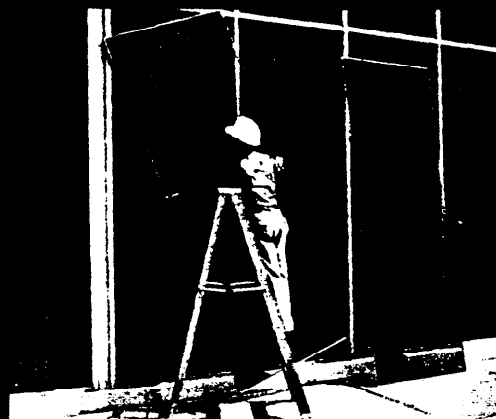
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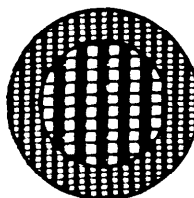
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EXTERIOR SHADING FOR WINDOWS AND DOORS

Phifer Sun Control Products

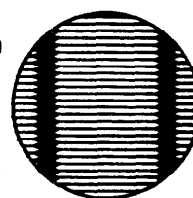


Phifer
SunScreen.



Woven of strong and durable fiberglass, SunScreen's unique weave can block up to 70% of the sun's heat and glare. Select from seven attractive colors.

Phifer
ShadeScreen.



ShadeScreen's louvered aluminum can block up to 87% of the total annual solar heat gain. Finished in architecturally neutral black to enhance any building exterior.



PHIFER WIRE PRODUCTS, INC.

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INSECT SCREENING

ALUMINUM SCREENING

BRITE-KOTE ALUMINUM INSECT SCREENING™

■ **BRITE ALUMINUM FINISH**
Phifer's standard aluminum screening. Finished in bright aluminum and noted for its strength and durability.

VISTA-WEAVE CHARCOAL ALUMINUM™

■ **CHARCOAL FINISH**
Standard aluminum coated with an attractive charcoal finish that reduces glare and improves outward visibility.

NEW BLACK ALUMINUM SCREENING

■ **BLACK FINISH**
Standard aluminum coated with a new modern black finish for good looks and the best outward visibility.

PACKAGING — Standard 100' Length Rolls: Individually boxed • **DIY 25' Rolls:** 4 rolls of one width per carton • Standard Widths: 24", 26", 30", 32", 34", 36", 42", 48", 54", 60" and 72" (25' rolls not available in 54", 60" or 72") • **Aluminum DIY:** Pre-cut individually shrink-wrapped DIY rolls • Available in standard Aluminum, Black or Charcoal finish • 16 rolls of one width per carton • Standard Sizes: 24" x 84" • 28" x 84" • 30" x 84" • 32" x 84" • 36" x 84" • 48" x 84"

FIBERGLASS SCREENING

phiferglass FIBER GLASS INSECT SCREENING®

■ Phiferglass is woven from permanent glass yarn, then coated with a protective vinyl to ensure lasting beauty, color and flexibility. It is produced under the most exacting conditions to meet extremely rigid specifications. Phiferglass is noncombustible and will not rust, corrode or stain.

18 x 16 MESH

The replacement for standard screens. Available in Silver Gray, Charcoal and Bronze.

18 x 14 POOL & PATIO MESH

A stronger mesh recommended for large openings such as porches, pools and patios. Available in Silver Gray, Charcoal and Aquamarine.

PACKAGING — Standard 100' Length Rolls: Individually wrapped. Standard Widths: 18 x 14 Mesh — 36", 48", 54", 60", 66", 72", 78" and 84" • 20 x 20 Mesh — 36", 48", 60", 72" and 84"

PACKAGING

Standard 100' Length Rolls: Individually wrapped.

DIY 25' Rolls: 4 rolls of one width per carton. Standard Widths: 24", 26", 28", 30", 32", 36", 42", 48", 54", 60", 72" and 84". DIY 25' Rolls not available in 54", 60", 72" or 84".

Phiferglass DIY: Pre-cut individually shrink-wrapped rolls. Available in Silver Gray or Charcoal. 16 rolls of one width per carton.

Standard Sizes: 24" x 84" • 28" x 84" • 30" x 84" • 32" x 84" • 36" x 84" • 48" x 84"

20 x 20 NO-SEE-UM MESH

This very tiny mesh is designed to keep out small flying insects (no-see-ums). Available in Silver Gray and Charcoal.

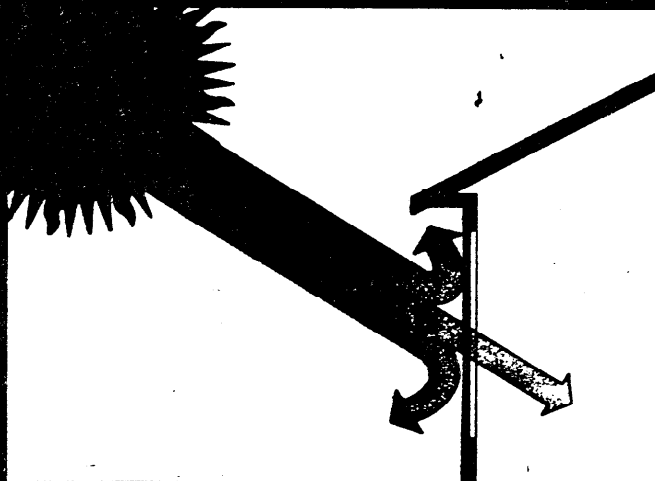
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Exterior Shading Helps Reduce "Greenhouse Effect"



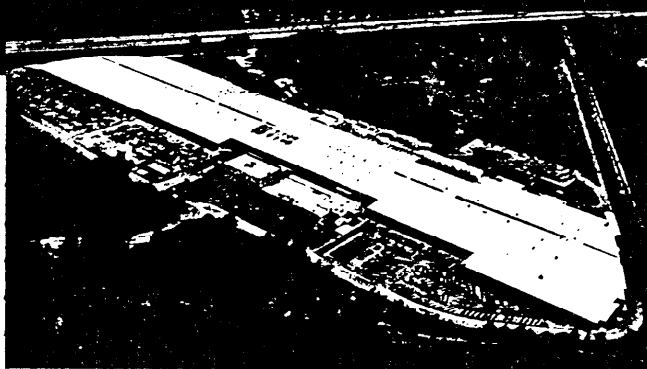
As the sun's rays pass through clear window glass they lose only a small percentage of their heat. However, once inside a building, these rays can be absorbed by

opaque objects within that building and released as radiant or convection heat.

The most effective way to prevent excess sun rays from entering through a glass window or door is with exterior shading. Exterior shading with an opaque object can absorb these sun rays before they reach the window surface and can release this heat harmlessly to the outside.

Exterior shading with Phifer SunScreen or ShadeScreen can block a large portion of these hot sun rays, but still allow enough visible light so as not to require any additional lighting. SunScreen or ShadeScreen can also reduce glare and ultraviolet rays to make window areas more comfortable and help reduce the fading of drapes and carpets and furnishings.

Compare the shading coefficients of Phifer SunScreen and ShadeScreen to any tinted, reflective or low emissivity sun control products available. Exterior shading is the best alternative for controlling the sun's heat and glare.



PHIFER WIRE PRODUCTS

Twenty-Five Years Involvement In Sun Control

Phifer Wire Products is the world's largest producer of conventional aluminum and fiberglass insect screening and also a pioneer in the development of solar screening products. Phifer SunScreen has been proven effective on thousands of commercial and residential installations as has ShadeScreen, which was originally developed by Kaiser Aluminum in 1952.

Phifer is now the exclusive worldwide manufacturer and distributor for SunScreen, Shadescreeen and new SheerWeave, a fabric for interior sun control.

Phifer Sun Control Products are backed by a 35-year reputation for quality, service and dependability.

TO FIND PHIFER SUN CONTROL PRODUCTS



Phifer Sun Control Products are available through a network of professional installers and fabricators.

To find a local dealer, look for the SunScreen or ShadeScreen logo in the Yellow Pages under:

1. Screens-Door and Window
2. Screening
3. Storm Windows & Doors

If you do not find a local dealer listed, or for additional information, contact Phifer Wire Products direct.

PHIFER WIRE PRODUCTS, INC.

P. O. Box 1700 • Tuscaloosa, AL 35403 • 1700

Call Toll Free, 1/800-633-5955

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6740100005 Rev. 5/91

The general conditions of the contract for the construction of buildings, standard form of the American Institute of Architects, current edition, are part of this specification.

Screening shall be Phifer **ShadeScreen** louvered aluminum, manufactured from 0.0080-inch thick 5052-H019 aluminum alloy sheet. Louvers shall be tilted 17 degrees to the horizontal. Louvers shall be spaced 17.5 to the vertical inch and shall be 0.910-inch long by 0.0571-inch wide. Louvers shall be separated by 0.078-inch wide vertical webs on 0.988-inch centers.

Standard Nominal Widths: 24," 30," 32," 36," 38," 42" and 48"

Finish: Black electrodeposition coating.

PERFORMANCE SPECIFICATIONS

A. Solar Shading.

1. **ShadeScreen** shall provide 100 percent shading at solar altitude angles of 31 degrees or greater.

2. **ShadeScreen** shall provide a shading coefficient of 0.15 with solar profile angle of 30 degrees or greater when evaluated, according to ASHRAE's 1972 Handbook of Fundamentals.

B. **Air Passage.** **ShadeScreen** shall permit an open area of at least 70.0 percent for air passage.

C. **Luminance Ratios.** **ShadeScreen** shall decrease luminance at windows and reduce

comfort glare so that acceptable luminance ratios may be maintained as recommended by the Illuminating Engineering Society.

D. **Reduction in Heat Loss.** **ShadeScreen** shall reduce heat loss outward through 1/4-inch clear plate glass at night under winter design conditions by at least 15 percent.

E. **Insect Protection.** **ShadeScreen** shall provide at least 17.5 horizontal louvers to the vertical inch; equivalent to standard insect screening.

F. **Visual Transmittance.** **ShadeScreen** shall provide an open area for horizontal vision greater than 60.0 percent of the actual surface area of the screen.

MATERIAL AND FRAMING REQUIREMENTS

Aluminum frame sections and accessories (extruded frame) minimum thickness of .050 gauge aluminum, 1-inch width; 3/8-inch depth minimums. (Roll form frame) minimum thickness of .032 gauge aluminum, 15/16-inch width, 3/8-inch depth minimums.

Fasteners or anchors other than aluminum or stainless steel shall be hot dip galvanized or cadmium plated after fabrication.

Work shall include all labor, materials and equipment to complete fabrication and erection of Phifer Aluminum **ShadeScreen** as herein specified and/or shown on drawings.

Surface in contact with ShadeScreen and other aluminum components shall be stainless steel, zinc, or cadmium—or if some other dissimilar metal, shall be given a heavy brush coat of zinc chromate primer made with a synthetic resin vehicle, followed by two coats of aluminum metal or masonry paint—or given a heavy coat of aluminum pigmented alkali-resistant bituminous paint, or separated with nonabsorptive gasket.

Duplicate samples of material with surface preparation and finish as specified shall be submitted for approval of the architect, shall be representative of material to be used on the project, and materials installed shall match approved samples.

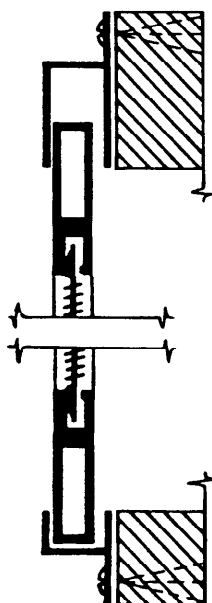
Fabrication and erection of ShadeScreen and related components shall be by skilled mechanics maintaining highest standards for this type of work.

Adequate protection shall be provided during fabrication, shipment, storage and erection to prevent stains, discoloration, marring or other damage to screens and adjacent structure. After erection, all work shall be cleaned and left in a condition satisfactory to the architect.

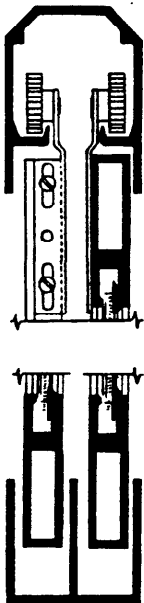
MAINTENANCE

ShadeScreen requires a minimum of maintenance. An annual cleaning with a mild detergent and water will ensure maximum efficiency.

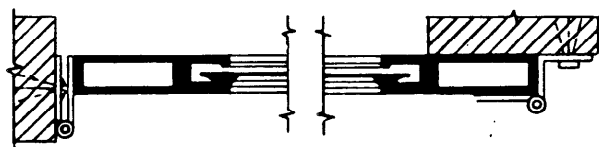
RECOMMENDED INSTALLATION METHODS



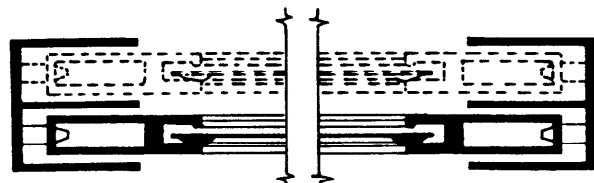
FIXED FRAME



HORIZONTAL SLIDING



SIDE HINGED

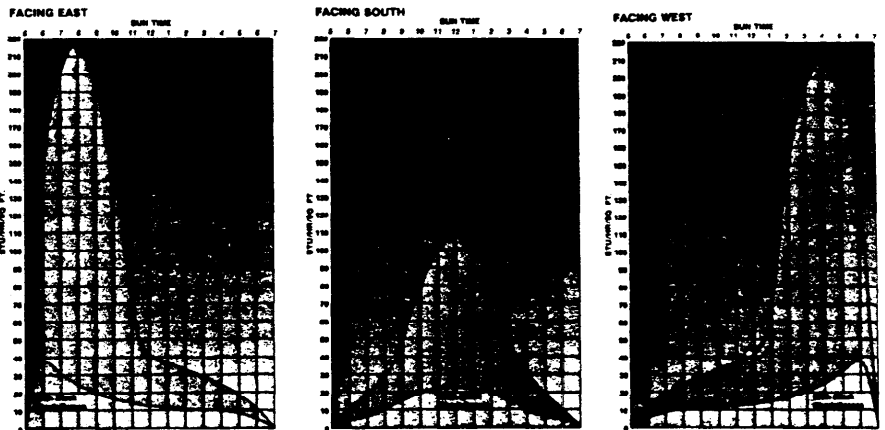
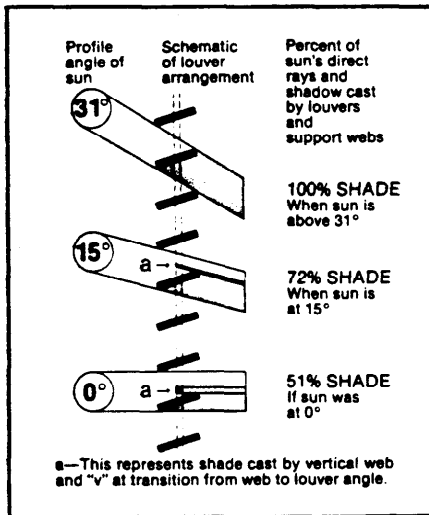


VERTICAL SLIDING

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dissipates heat trapped between the screen and glass when windows are closed. The unique angle of the louvers gives a high degree of visibility from within and lets in controlled useful light. ShadeScreen also offers highly desirable daytime privacy.

HOW SHADESCREEN WORKS



TYPICAL HEAT GAIN

UNIQUE SHADESCREEN FEATURES

- Keeps rooms up to 15 percent cooler
- Improves air conditioning efficiency
- Reduces energy waste
- Reduces the sun's heat and glare
- Helps protect furnishings, carpets, and drapes against fading
- Architecturally neutral black finish
- Can't bubble or peel like rub-on films
- Screens out most insects
- Fits any size window
- Rustproof

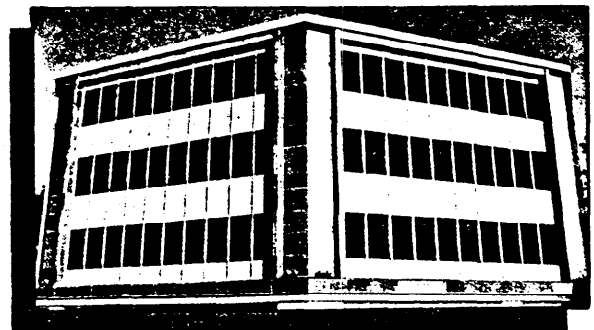
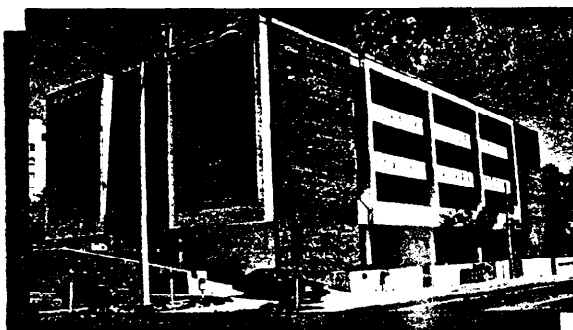
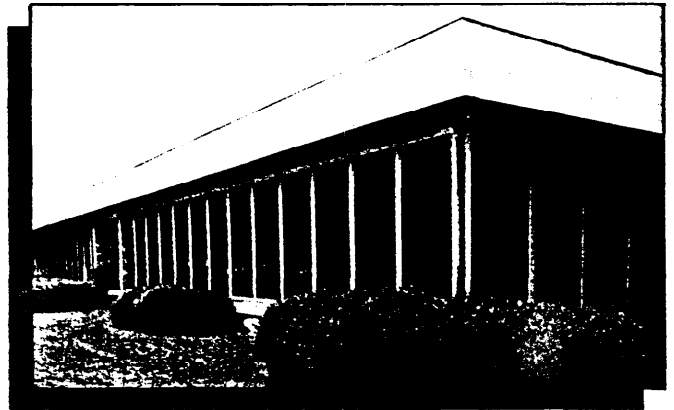
EFFECTIVENESS OF SHADESCREEN COMPARED WITH OTHER WINDOW TREATMENT METHODS

Based on 40° N. Lat., west exposure, 4 p.m., July 21

WINDOW TREATMENT	SHADING COEFFICIENT	INSTANTANEOUS HEAT GAIN BTUH/sq. ft.
Black ShadeScreen With 1/4" Clear Glass	.13	27**
Double Glazed Solar Cool Bronze® With 1/4" Clear	.34	76*
Double Glazed 1/4" Heat Absorbing With 1/4" Clear	.54	117*
Single Glazed 1/4" Heat Absorbing	.87	145*
Double Glazed 1/4" Clear Both Lites	.80	173*
Single Glazed 1/4" Clear	.93	201*
Single Glazed 1/4" Clear	1.00	216*

*ASHRAE Guide
†Instantaneous solar heat gain, BTUH/sq. ft.

**Metra, Inc. Report 10-278-Jan 29 1981



SunScreen GENERAL SPECIFICATIONS

The general conditions of the contract for the construction of buildings, standard form of the American Institute of Architects, current edition, are part of this specification.

Screening shall be Phiferglass® SunScreen, vinyl-coated fiberglass produced in a ribbed-weave configuration, arranged so as to provide adequate outward vision with mesh size to afford the required strength and insect protection, using yarns as directed in ASTM D-3374 specifications for vinyl-coated glass yarns. Material must also meet Screen Manufacturers Association standards 4001 or 5001 for vinyl-coated fiberglass solar screening.

Standard Widths: 24," 30," 36," 48," 60," 72" and 84," 42" available in Charcoal only.

Standard Roll Length: 100 linear feet.

Standard Colors: Silver Gray, Charcoal, Bronze, Dark Bronze, Gold, White and Antique White. White and Antique White available in 36," 48," 60," 72" and 84,"

PERFORMANCE SPECIFICATIONS

Test data must be furnished for solar screening material used. All tests conducted in accordance with ASHRAE Standard 74-73 method of measuring solar optical properties of materials or other generally accepted methods must show for the mate-

rial the following minimum performance levels:

Solar Transmittance (Ts):..... 24%
Solar Reflectance (Rs):..... 13%
Solar Absorptance (As):..... 63%
Shading Coefficient (Sc):..... 0.32

Using procedures outlined in the standard, the solar transmittance (Ts), solar reflectance (Rs) and solar absorptance (As) were determined by direct measurement at a profile angle of zero degrees. These values along with the thermal transmittance values determined in previous tests were then used to calculate the shading coefficient.

Performance evaluations conducted by Matrix, Inc., Mesa, Arizona. Characteristics shown are for Silver Gray. Complete test data available upon written request.

MATERIAL AND FRAMING REQUIREMENTS

Phiferglass SunScreen is easily adapted to most standard window and framing systems. For best results, SunScreen should be mounted exterior to the glass surface.

Suggested minimums for aluminum framing components:

Commercial Installations: aluminum roll form sections .032" minimum thickness or aluminum extruded sections .050" minimum thickness with appropriate matching

components.

Residential Installations: aluminum roll form sections .025" minimum thickness or equivalent in extruded aluminum with appropriate matching components.

Duplicate samples of SunScreen and framing material in color and finish as specified shall be submitted for approval of the architect, shall be representative of material to be used on the project, and materials installed shall match approved samples.

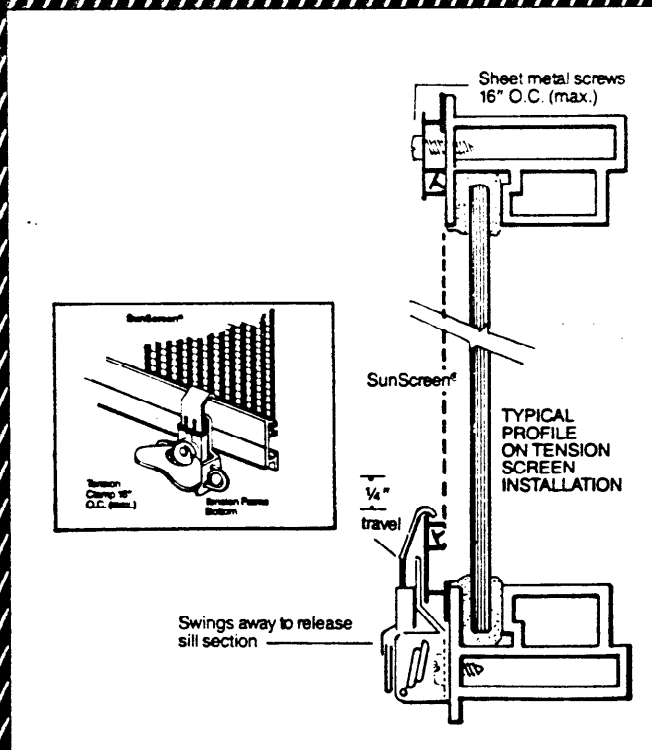
Fabrication and erection of SunScreen and related components shall be by skilled mechanics maintaining highest standards for this type of work.

Adequate protection shall be provided during fabrication, shipment, storage and erection to prevent stains, discoloration, marring or other damage to screens and adjacent structure. After erection, all work shall be cleaned and left in a condition satisfactory to the architect.

MAINTENANCE

SunScreen's flat weave is not easily damaged and requires only a minimum of maintenance. An annual cleaning with a mild detergent and a soft brush, followed by a thorough rinsing with clean water will ensure maximum efficiency.

RECOMMENDED INSTALLATION METHODS



Phifer ShadeScreen®

LOUVERED ALUMINUM FOR SUN CONTROL

BLACK FINISH

The black finish of ShadeScreen is designed to be architecturally neutral when used over the glass surfaces of commercial buildings.

This finish is an electrodeposition coating process which fully encapsulates the bare aluminum. The result is an extremely strong, durable and corrosion-resistant finish. The black finish also contributes to the material's shading coefficient of .13 by reducing reflection of both direct and indirect sun rays.

PHYSICAL ATTRIBUTES OF SHADESCREEN

DISTINCTIVE APPEARANCE... FROM INSIDE AND OUT

ShadeScreen's subdued pattern lends subtle interest without intruding on architectural design. With over 17 louvers per inch and supporting vertical webs only 5/64" wide and almost 1" apart, ShadeScreen gives a fabric-like effect.

REDUCES GLARE FOR COMFORT AND EFFICIENCY

By intercepting high-sky glare and by breaking up much of the light below the 31° angle, ShadeScreen helps reduce eye fatigue and provides a pleasant, soft lighting effect.

PROTECTS FINISHES AND FURNISHINGS

The sun's direct rays are a principal cause of fading and deterioration of interior finishes, draperies, floor coverings and furnishings. By intercepting

most of the sun's heat and ultraviolet rays, ShadeScreen helps to reduce this fading, increasing the life and lowering the maintenance of interior furnishings.

How SHADESCREEN stops most of the sun's direct rays, cuts instantaneous solar heat gain

Sun Profile Angle	Solar-Optical Properties			Shading Coefficient For ShadeScreen	
	T _s	R _s	A _s	% Clear Glass	% Clear Glass
0	31	2	67	0.40	0.40
10	29	2	78	0.30	0.29
20	26	2	90	0.19	0.19
30	22	2	96	0.13	0.13
40	17	3	96	0.12	0.12
50	11	3	96	0.12	0.12
60	5	3	96	0.12	0.12
75	5	4	91	0.16	0.16

Tests conducted in accordance with ASHRAE standard 74-73 or other generally accepted methods. The solar transmittance (T_s), solar reflectance (R_s) and solar absorptance (A_s) were used to determine the corresponding shading coefficients (SC) at each profile angle. Complete test results are available upon request.

70 PERCENT OPEN AREA PROVIDES LIGHT, VENTILATION AND HIGH VISIBILITY

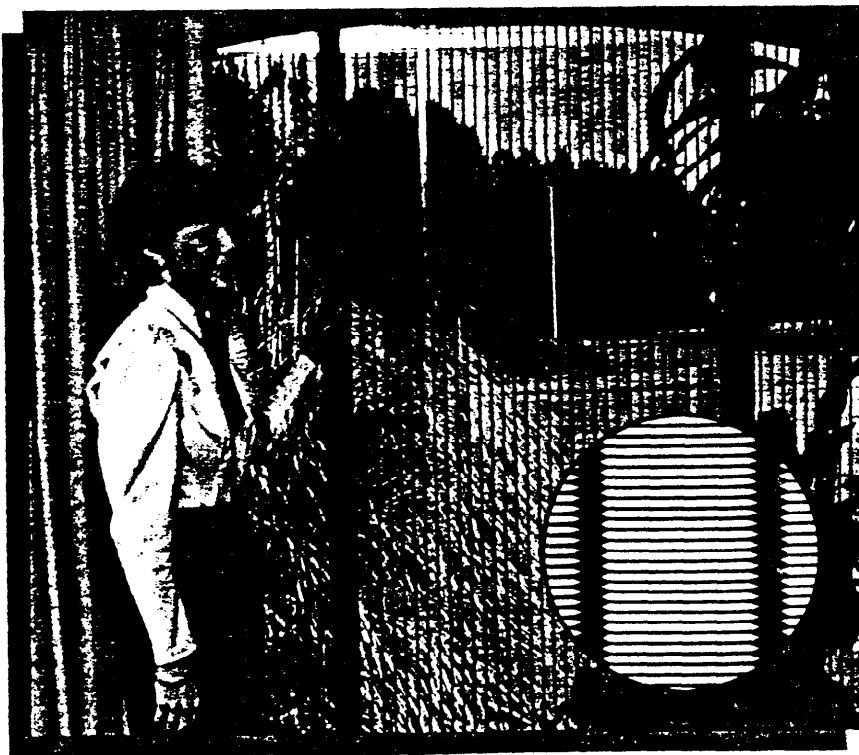
As much as 70 percent of ShadeScreen is open—unobstructed by the tiny louvers or support webs. This offers excellent ventilation when windows are open and

A metal (aluminum) exterior shading device, **ShadeScreen** blocks transmitted solar radiation, which typically accounts for about 80 percent of the total solar load coming through windows and glass doors. **ShadeScreen** blocks this heat and glare before it reaches the glass surface.

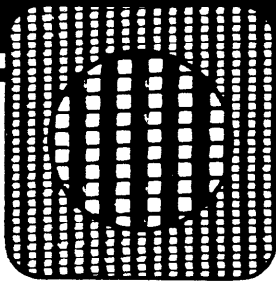
ShadeScreen offers high efficiency, lower initial costs and a shorter payback time when compared to solar window glass or to other types of metal shading devices.

ShadeScreen was originally manufactured by Kaiser Aluminum in 1949 and has been proven effective on thousands of commercial and residential installations nationwide including hospitals, libraries, motels, apartments, offices, hotels, homes, factories, schools, restaurants, and public buildings.

ShadeScreen is manufactured and distributed worldwide exclusively by Phifer Wire Products, the world's largest producer of conventional screening products. Phifer also manufactures **SunScreen®** solar screening and new **SheerWeave®** fabric for interior shading.



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SUNSCREEN'S UNIQUE PATENTED WEAVE

10700/PHI
BuyLine 1612

(U.S. Patent No. 4,002,188)

Phiferglass SunScreen is an open weave made of durable vinyl-coated fiberglass yarn. After weaving, SunScreen is heat-treated so as to ensure a stable and quality product.

SunScreen is manufactured exclusively by Phifer Wire Products, Inc.

more constant glass temperatures.

If a building is not designed to receive, store and distribute solar energy, sun coming through a window during the winter months may actually be of little or no value. Consequently, most building owners elect to leave solar screens in place year-round. However, framed SunScreen solar screens may be easily removed during winter months to allow full solar heat gain if desired.

PAYS FOR ITSELF . . . The savings in energy costs alone will usually pay for the installation of SunScreen in a few short years. Projected savings may be estimated by using ASHRAE standards along with SunScreen data on page six.

PHYSICAL ATTRIBUTES OF SUNSCREEN

BEAUTY AND PRIVACY . . . During the daytime, SunScreen appears virtually opaque from the outside while permitting natural light and visibility for people on the inside.

ATTRACTIVE BUILDING EXTERIORS . . . SunScreen oftentimes enhances

building appearance, lending a look of architectural uniformity.

SunScreen is available in a variety of colors to harmonize with architectural designs.

REDUCES FADING . . . Penetration of ultraviolet radiation to the interior is significantly reduced.

INSECT PROTECTION . . . The mesh of Phiferglass SunScreen's unique weave is designed to replace regular insect screening. The openings in the mesh are small enough to stop even tiny insects.

WORKS WITH WINDOWS OPEN OR CLOSED . . . Since SunScreen is normally installed outside the window, it performs equally with windows open or closed . . . an important factor in summer months. The open mesh of SunScreen allows cool breezes to flow through.

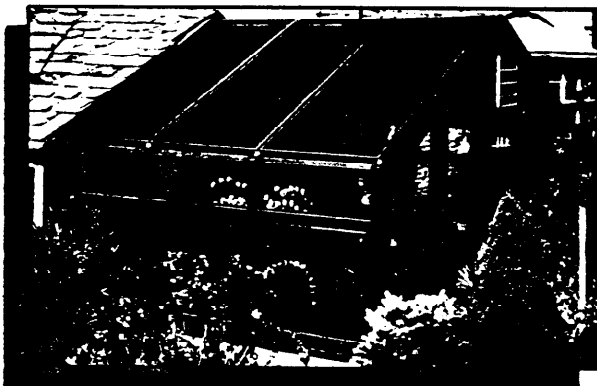
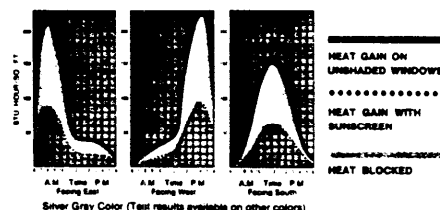
DOES NOT COME IN CONTACT WITH GLASS SURFACE . . . SunScreen is installed inches away from the glass and not directly on the glass surface. SunScreen cannot cause cracking, bubbles or streaking sometimes associated with other sun-control products.

REDUCES WINDOW WASHING . . . SunScreen protects windows from dirt and rain streaks. Many users report time intervals between washings are greatly lengthened with SunScreen installed.

SOLAR CONTROL PROPERTIES OF PHIFERGLASS SUNSCREEN® TYPICAL

The charts below compare the amount of instantaneous solar heat gain between ordinary glass windows with SunScreen and those without. The shaded area between represents the heat blocked in BTU/hr/sq. ft.

The figures from these charts are based on 40° N. latitude (a line that would run approximately from Philadelphia to San Francisco).



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CONSUMER PRODUCT INCIDENT REPORT

1. NAME OF RESPONDENT <i>Phifer Wire Prod</i>		2. TELEPHONE NO. (Home) (Work)	
3. STREET ADDRESS		4. CITY STATE ZIP CODE <i>Tuscaloosa, AL</i>	
5. DESCRIBE ACCIDENT SITUATION OR HAZARD, INCLUDING DATA ON INJURIES. (Use second page if necessary.) <i>Complainants believe that fiberglass window ^{sun}screen is emitting toxic offgas.</i>			
6. DATE OF INCIDENT(S)	7. IF INJURY OR NEAR MISS, OBTAIN AGE _____ SEX _____ AND DESCRIBE INJURY _____	8. IF VICTIM DIFFERENT FROM RESPONDENT, PROVIDE NAME _____ RELATIONSHIP _____	
9. DESCRIPTION OF PRODUCT <i>Fiberglass Window Sun Screen</i>		10. BRAND NAME	
11. MANUFACTURER/DISTRIBUTOR NAME, ADDRESS & PHONE <i>Phifer Wire Prod Tuscaloosa, AL</i>		12. MODEL, SERIAL NO.'S	
		13. DEALER'S NAME, ADDRESS & PHONE	
14. WAS THE PRODUCT DAMAGED, REPAIRED OR MODIFIED? YES _____ NO _____ IF YES, BEFORE OR AFTER THE INCIDENT? _____ Describe _____		15. PRODUCT PURCHASED NEW _____ USED _____ DATE PURCHASED _____ AGE _____	
		16. DOES PRODUCT HAVE WARNING LABELS? IF SO, NOTE: _____	
17. HAVE YOU CONTACTED THE MANUFACTURER? YES _____ NO _____ IF NOT, DO YOU PLAN TO CONTACT THEM? YES _____ NO _____ OTHER _____	18. IS THE PRODUCT STILL AVAILABLE? YES _____ NO _____ IF NOT, ITS DISPOSITION _____	19. MAY WE USE YOUR NAME WITH THIS REPORT? YES _____ NO _____	
FOR ADMINISTRATION USE			
20. DATE RECEIVED <i>6/10/93</i>	21. RECEIVED BY (Name & Office) <i>J. Hayes</i>		22. DOCUMENT NO. <i>X3 97545(A-M)</i>
23. FOLLOW-UP ACTION <div style="text-align: center;">SEP 17 1993</div>			24. PRODUCT CODE(S)
25. DISTRIBUTION		26. ENDORSER'S NAME & TITLE	

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